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Identification and triage of a Morel-Lavallée lesion using point of care ultrasound

Abstract

Introduction:

A Morel-Lavallée lesion is a relatively rare, closed, degloving injury. Polytrauma and severe injuries through to seemingly innocuous trauma can distract the clinician from thorough assessment of the affected site. Missed or misdiagnosis of the closed lesion is reported from both a clinical and imaging perspective.

Case Report:

A 46 year old male is discharged from accident and emergency following a cycling accident. The case of a Morel-Lavallée lesion identified by an advanced practice physiotherapist during a telephone clinic during the Covid-19 pandemic is presented.

Discussion:

The aetiology, imaging and clinical management of a Morel-Lavallée lesion is discussed. The addition of diagnostic ultrasound skills to clinical assessment in this case report may have improved patient care and experience by offering a 'one stop shop' to care. Formal training in musculoskeletal ultrasound imaging is emphasised.

Conclusion:

Thorough history taking, clinical reasoning and subsequent application of robust imaging led to the identification of a Morel-Lavallée lesion and, in this case, highlights the value of a point of care ultrasound model in a triage setting.

Introduction

A Morel-Lavallée lesion (MLL) is a post-trauma, closed, soft tissue degloving lesion. A compressive and tractional trauma separates the subcutaneous tissue layers from the deep underlying fascia. Disruption to the penetrating vessels causes blood, lymph and fat to fill the cavity between the layers.¹ (Figure 1). This collection can create a characteristic fluctuant swelling, indicative of an acute MLL.¹ (Figure 2).

Case History

A 46 year old, athletic male attended the emergency department following a high speed bicycle accident. Following assessment and radiographs, a type 3 acromioclavicular joint (ACJ) disruption was identified; the patient was placed in a sling and discharged to physiotherapy.

Due to restrictions on face-to-face consultations as a consequence of the Covid-19 pandemic, a telephone consultation with an advanced practice physiotherapist (APP) took place ten days post incident. Referral information was limited to ACJ type 3, physio please, and the date of injury. Comprehensive history taking noted a small lateral thigh swelling in keeping with haematoma. Features of concern included a 'water bed' feeling, pain and local hypoesthesia at the site. The patient denied any comorbidities or taking anticoagulant medication.

An elevated index of suspicion prompted the APP to arrange a face-to-face appointment with the patient for the following day. Physical examination revealed the limb was well perfused and full hip and knee movement was present. A small to moderately sized, minimally tender, fluctuant fluid collection inferior to the left greater tuberosity was observed. Light bruising and a minor abrasion were noted, but no signs of infection or inflammation (Figure. 2).

Ultrasound imaging of the lesion was undertaken by the APP using a Philips Affiniti (Philips Healthcare, Guildford, Surrey) with an 18.5 MHz linear transducer. An anechoic, avascular, encapsulated lesion (9.23cm x 0.97cm) sited deep to the subcutaneous fat but superficial to the hip musculature was observed (Figures 3 and 4).

The sonographic differential was of a sub-acute MLL and this correlated with the history and clinical presentation. An orthopaedic consultant surgeon reviewed the patient and advised conservative treatment. The patient was advised to apply compression to the area and safety netted on the signs of infection. No orthopaedic follow up was made and the patient was discharged to the APP.

At six month clinical assessment a small, firm, asymptomatic fluid collection was observed. Subjectively, lesion volume had regressed uniformly whilst sensation almost returned to pre injury level. No functional impairment was reported, negating the need for further clinical review or imaging. Further images were however obtained for the purpose of training and education and dissemination of findings through publication. The lesion measured 8.25cm x 0.41cm. (Figure 5).

The patient has consented for his case and images to be used.

Discussion

First described in the mid-1800s, the MLL is a rare lesion most frequently observed following high energy polytrauma. MLLs produced on low velocity impact such as ground level falls, sport and seat belt traction have also been recorded.^{1, 2}

The relative mobility of the surrounding soft tissues in relation to the firm attachments of the underlying fascia make the lateral hip susceptible to MLL.³

Other sites include the lower back, anterior knee, upper arm and the posterior aspect of the head.⁴ An MLL can be readily missed on initial trauma assessment, particularly where bony disruption or other serious injury is identified in a different anatomical region, thus 'distracting' from a seemingly innocuous soft tissue lesion.

Timely identification of an MLL however is essential as infection and subsequent soft tissue necrosis are potential complications³. This case study therefore illustrates the importance of history taking beyond the details on a referral form and attending to the subjective reporting from the patient.

APP roles typically incorporate complex decision making within unpredictable and specialised contexts.⁴ Advanced clinical assessment skills across conditions, rapid access to imaging and second opinion, and onward referral, make APP roles invaluable across services. This case study illustrates an APP's ability to utilise ultrasound imaging as an integral aspect of patient assessment and the value of a point of care ultrasound (PoCUS) approach.

Ultrasound appearance of an MLL is of a non-specific fluid collection just superior to the muscular plane and contained entirely between the deep fascia and subcutaneous layers. Acute and subacute lesions of less than one month have an irregular margin, are compressible, lobular in shape and without flow. The presence of floating lobules of increased echogenicity (fat particles) differentiates an acute MLL from that of bursitis or haematoma.⁵

Haemorrhagic and lymphatic content contained within an MLL can also be demonstrated with computed tomography (CT) and magnetic resonance imaging (MRI).⁶ An MLL may often be an 'additional' finding following urgent CT imaging of orthopaedic polytrauma. Non ionizing radiation modalities such as MRI and ultrasound are more frequently used to investigate and stage lesions. A published classification of MLL, using features seen on MRI, identifies and categorises six stages of MLL development and chronicity³. Chronic changes to the internal content of an MLL are typically homogeneously hypointense on T1 weighted MRI sequences. Costs and access to complex imaging can be prohibitive, including in a point of care context.

Other post-traumatic, inflammatory and soft tissue tumours can be easily confused with MLL lesions². Haematomas, abscesses, large lipomas and soft tissue sarcomas can pose a challenge to clinicians in differentiating from an MLL. A clear and concise patient history and area of lesion can aid differentiation. Reliable findings on ultrasound include location within an anatomic compartment and relationship to the surrounding tissues. Such diagnostic features, when used in conjunction with extended field of view and anatomical location can help differentiate an MLL from other lesions.^{1, 5} Confidence in the ultrasound imaging findings and their interpretation are integral to clinical decision making. This is, in part, determined by the training and demonstrable competency of the professional undertaking the imaging.

Chronic lesions of 18 months or more differ in appearance from acute lesions. They appear homogeneously hypoechoic with smooth margins and have a flattened or fusiform appearance.^{1, 5} A chronic MLL, ranging from months to years post injury, can present as a firm and painful swelling, mimicking that of a soft tissue sarcoma.

Although ultrasound may be an effective diagnostic tool for soft tissue masses, variable internal echogenicity, shape, and margin features can make specific diagnosis difficult in chronic lesions. Guidance published by The British Sarcoma Group (2019) may aid the assessment and differentiation of soft tissue masses in the trunk and extremity.⁶ MRI is therefore recommended if there is uncertainty, as mischaracterisation can have serious implications.^{1, 2, 3} Whilst the mechanism of injury and sonographic appearance were strongly indicative of an MLL, the potential for a pre-existing lesion (e.g. vascular, benign or metastatic) to co-exist must be also considered. In this case, a detailed subjective history that correlated to clinical findings and imaging, informed both the diagnosis and subsequent treatment.

Treatment strategies within the literature are frequently aligned to the stage, size and infection status of the lesion. Reported infection rates range from 19% to 50% and in such cases should be promptly managed by the medical team.⁸

Early identification of acute small lesions, those without signs of infection or a definitive capsule identified on ultrasound, as in this case report, often improve with conservative measures. Conservative management includes compression, non-steroidal anti-inflammatories and physiotherapy.^{2, 9} Larger acute lesions however may improve with ultrasound guided percutaneous drainage. Needle blockages and infection have however been reported. Sclerotherapy has also been utilised in large lesions failing to respond to conservative measures with varying effectiveness.^{2, 9}

The variable site of lesion, injury mechanism, and sometimes delayed presentation may contribute to delayed or missed diagnosis. Delayed diagnosis, both in the acute and chronic stages, may require additional specialist referrals, further imaging and contribute to poorer outcomes.² Despite the APP's upper limb specialism, his clinical knowledge and CASE (Consortium for the Accreditation of Sonographic Education) accredited musculoskeletal training enabled him to diagnose and improve patient care.¹⁰ As such, this training provided the foundation for the robust use of PoCUS imaging, which was concurrently integrated with the clinician's pre-existing expertise in musculoskeletal diagnosis, triage and treatment.

Delay in diagnosis can lead to the presentation of lesions later in the stage of their development. Chronic lesions are noted to develop a capsule which may require more invasive intervention. Surgical drainage and suction drain have been recommended if >50mL is aspirated.^{2, 5} Surgical intervention, often reserved for infected and complex cases, may require major surgery involving open debridement with vacuum sealing drainage and skin grafting.^{2, 5}

Conclusion

Morel-Lavallée lesions are rare but should be considered when the mechanism of injury involves compression and traction or shearing of the soft tissues.

Both acute and chronic MLL may present for imaging at various time points and can therefore pose diagnostic challenges to clinicians. Missed and mischaracterisation of lesions can have serious implications.

MRI is a reliable imaging modality in investigating an MLL and differentiating soft tissue lesions but is expensive and access can be limited. Diagnostic ultrasound, as in this case, is an appropriate adjunct to clinical examination when used by experienced clinicians. A critical factor here is both the training and competency of the ultrasound user and the ability to combine image findings with the clinical context. Early identification of lesions, such as in a PoCUS setting, may impact treatment choice and outcomes and could therefore be of value for patients and healthcare systems.

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Figure 1. Cross sectional illustrations of tissue layers and the subsequent disruption following a shearing force. The perforation of vessels resulting in the formation of a fluid filled space is also detailed. Image courtesy of Dr Matt Skalski, Radiopaedia.org, rID: 22762 ¹

Morel-Lavallée mechanism

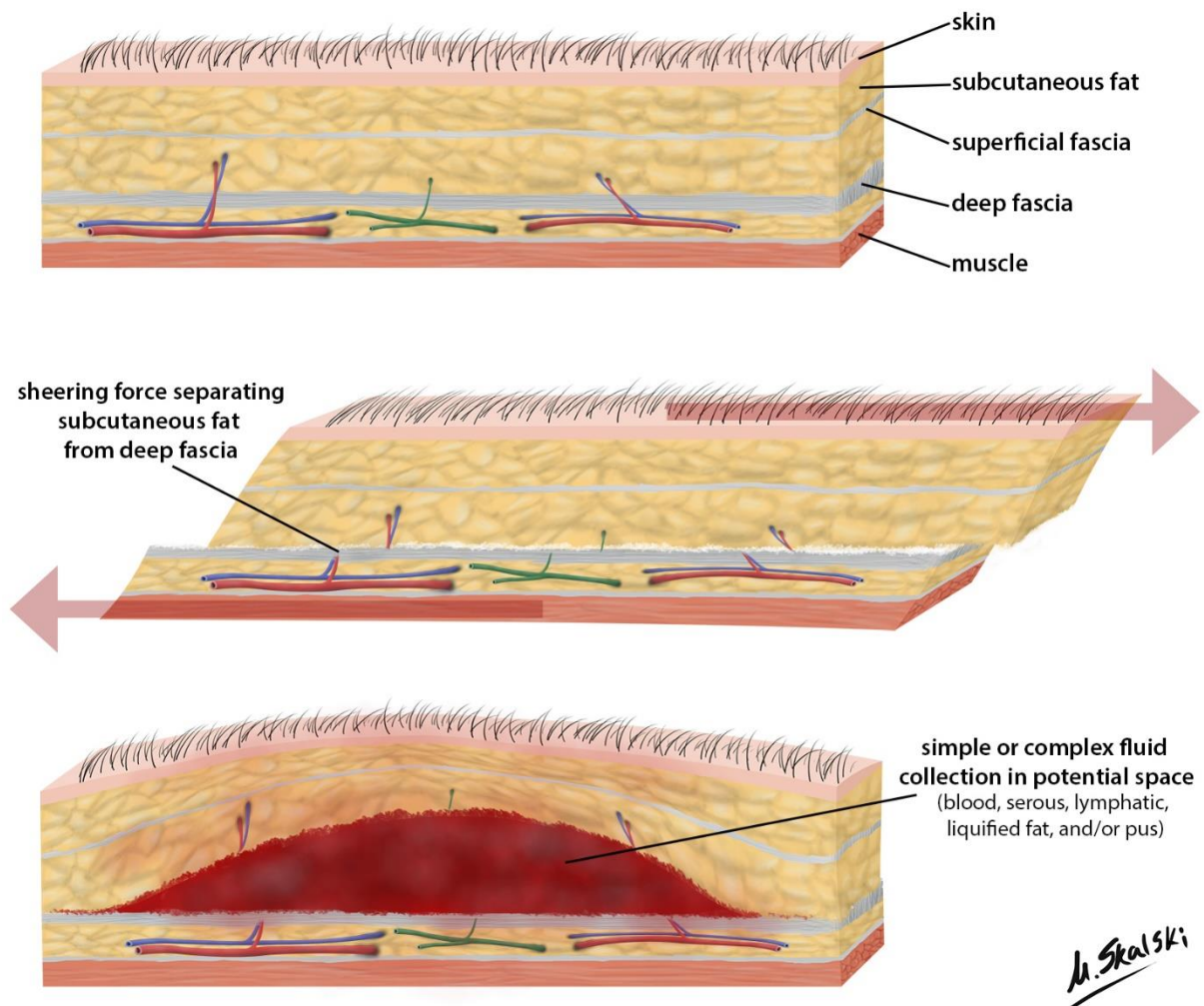


Figure 2. Swelling evident at left upper lateral thigh highlighting change in thigh contour. Minor abrasion noted.





Figure 3. Extended field of view with measurements of well-defined Morel Lavallee Lesion contained between the deep fascial layer and the superficial layer of the lateral thigh.

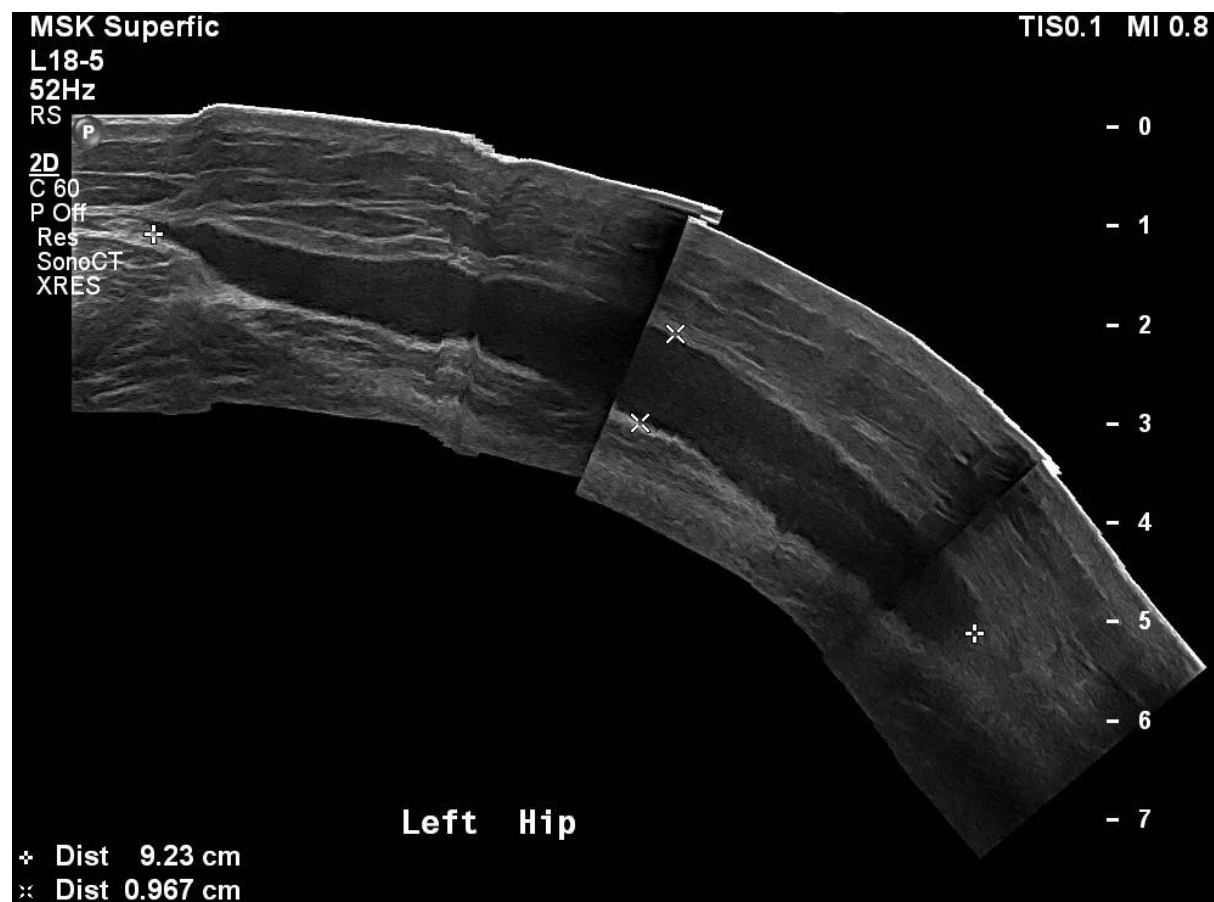


Figure 4. US Doppler image of Morel Lavallee Lesion indicating no vascularity



Figure 5. Extended field of view of lateral thigh MLL six months post trauma.

